A SUBSTITUTE FOR INDIA INK FOR USE IN RADIANT HEAT PAIN THRESHOLD STUDIES*

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In a previous report (1), attention was called to the stimulatory action on skin surfaces of india ink which previously had been looked upon as an inert blackening agent when used in radiant heat pain threshold determinations. Controlled studies (1) in 50 patients indicated that the application of india ink on normal skin is detectable by the patient in the form of one or more of a variety of sensations. Hence, it was postulated, the effects of india ink may thus prejudice or interfere with determinations of radiant heat pain thresholds. It is the purpose of this paper to describe a material which offers the same desirable qualities as india ink but which is essentially free of the sensory disturbing properties of india ink.

After the investigation of a number of potential materials, it was determined that a commercially available black food coloring material (additive) known as Pyla Cert‡, Ebon Black, Ext. D and C, Mx-122, was a material of choice. In order for Ebon Black to offer proper "blackening" properties, it must be mixed with water to a concentration of 7 grams of Ebon Black to 226 grams of water.

The results of the two studies reported herewith adequately support the contention that Ebon Black is superior to india ink for use in radiant heat pain threshold studies. The first study (Part I) was intended to compare the sensory disturbing qualities of Ebon Black with those of physiological saline. The second (Part II) was intended to compare the sensory disturbing qualities of Ebon Black with those of india ink. The methods and technic employed in both of these studies closely paralleled those followed in the publication noted above (1).

This study was supported in part by an Institutional Grant from the National Institutes of Health.
Received for publication July 1, 1964.

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PART I

Method

Fifty volunteer subjects, age 12 to 65, 38 of whom were dental students, were used as subjects in this blind study. Subjects were comfortably seated with the eyes closed. The black food coloring was gently painted on one side of the forehead, and physiological saline was painted on the other. A similar technic was used in applying the two substances on the dorsal skin surface of the hand. In an effort to eliminate as many variables as possible, the right and left "paintings" were carried out in a random fashion.

Immediately after the applied agents had dried, a series of carefully worded questions concerning the presence or absence of any sensation* and the nature of the sensation in the painted area was asked of each subject.

Results

Sensory Findings:

Forehead

No sensation§ experienced with either saline or black food coloring	43
A positive sensation experienced with saline only	1
A positive sensation experienced with black food coloring only	6

Hands

No sensation experienced with either saline or black food coloring	43
A positive sensation experienced with saline only	4
A positive sensation experienced with black food coloring only	3

The above findings demonstrate that the subjects were not able to distinguish sensations caused by the Ebon Black food coloring substance from those caused by physiological saline. Furthermore, the vast majority of subjects (43 of 50) was unable to detect any sensation in the Ebon Black painted areas—forehead or hand. These findings are in sharp contrast with those

§ Stiff, thick, pulling, caking, cracking, puckering, tight, crusty, sticky, taut, dry, irritating, drawing, astringent, crinkly, hard, heavy, "something there."

following the application of india ink as previously reported (1).

Clinical Findings: Aside from the obvious coloring action, no significant clinical findings were discernible in the study sites. In all instances, the Ebon Black coloring could be easily removed by washing with soap and water.

PART II

Method

Fifty male volunteer subjects, age 12–39, including 46 dental students, 2 members of the faculty, as well as 2 additional nonprofessional individuals, formed the basis for this portion of the blind study. In this phase, the Ebon Black food coloring was painted on one side of the forehead while india ink was painted on the other. A similar technic was used in applying the two substances to the dorsal skin surface of the hands. Here also, in an effort to eliminate as many variables as possible, right and left paintings were carried out in a random fashion. Following the drying of the applied agents, the same series of questions was again directed to each subject.

Results

Sensory Findings:

Forehead

No sensation experienced with either india ink or black food coloring	16
A positive sensation experienced with india ink only	33
A positive sensation experienced with black food coloring only	0
A positive sensation experienced with black food coloring and india ink	1

Hands

No sensation experienced with either india ink or black food coloring	9
A positive sensation experienced with india ink only	39
A positive sensation experienced with black food coloring only	2
A positive sensation experienced with black food coloring and india ink	0

The above results again demonstrate that applications of india ink to the skin of the forehead and hands were followed by sensory disturbing actions, namely, in 34 of 50 subjects at the forehead site and 39 of 50 subjects at the hand site.

Of greatest interest, however, was the finding that in a total of only 3 instances, once on the forehead and twice at the hand site, was a positive sensation experienced following the application of the black food coloring material.

In all instances, the Ebon Black coloring could be easily removed by washing with soap and water.

Clinical Findings: Examination of the Ebon Black and india ink blackened test sites revealed the following interesting findings: 1. The Ebon Black sites appeared to be more evenly or homogeneously blackened as compared to the india ink sites which appeared to be more mottled or flecked in texture; 2. The Ebon Black sites were smooth and "uncoated" whereas the india ink sites were frequently slightly raised and glossy and exhibited a "coated" appearance.

CONCLUSION

Ebon Black, a black food coloring agent, has been shown to be an effective device and should be investigated further as a skin blackening agent for use with radiant heat pain threshold testing technics.

REFERENCES

1. Kutscher, A. H., Hoffman, P., Beckerman, T., Zegarelli, E. V., Kirschner, G. and Thompson, Jr., R.: The stimulatory action of india ink. J. Invest. Derm., **41:** 45, 1963.